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SCIENCE AND NATIONAL POLICY*

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THAT our national security, health, and prosperity depend to a great extent on science for their maintenance and their future improvement, no informed person would deny. The great drafts which we are making upon our natural resources, the demands of labor for a better standard of living, the requirements of industry for markets and profits, and international competition all pose problems among whose essential requirements for long term solution are vigorous advance of scientific knowledge and equally vigorous application of this knowledge for useful purposes.

The subject "Science and National Policy" therefore deals with one of our important national problems. I can only hope to paint the picture with a few broad strokes and to discuss certain specific measures now before Congress on which wise action is needed promptly.

Historically, our federal government has concerned itself with science in two directions: first, through its permanent scientific bureaus; and, second, through its calls for temporary help in times of emergency.

Within the framework of the federal government there are about forty bureaus of more or less scientific character. Generally speaking, these are service bureaus which employ scientific methods to supply the public with types of information or help which private enterprise is not well fitted to provide. The Bureau of Standards, the Weather Bureau, the Geological Survey, the Bureau of Mines, and various bureaus in the Department of Agriculture are

examples. Their services to the public are essential and should be maintained in a high state of efficiency.

In times of great emergency the federal government has called upon the creative scientists of the country generally for help, and this help has always been given wholeheartedly, to the very great advantage of the country. In 1863, at the time of the Civil War, the National Academy of Sciences was established by Act of Congress and approved by President Lincoln. This Act specified that "the Academy shall, whenever called upon by any department of the government, investigate, examine, experiment, and report upon any subject of science or art. . . ."

Again, when war clouds hung low over the world in 1916, President Wilson by executive order requested the National Academy of Sciences to establish the National Research Council as a measure of national preparedness.

Again in 1940, when threat of war hovered on our horizon, President Roosevelt established the National Defense Research Committee which, one year later, was enlarged by the establishment of the Office of Scientific Research and Development. And during the darkest days of this World War II, when Japan had cut our lifelines to natural rubber, the President appointed the Rubber Survey Committee which organized a group of scientists, engineers, and businessmen under the statesmanlike leadership of Bernard M. Baruch to establish a program for meeting this technological crisis.

In every one of these cases the scientists of the country responded immediately to render national service with

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outstanding effectiveness. The recent success of the rubber program and the wartime achievements of the scientists in developing new medicines or new weapons, culminating with the atomic bomb, are too freshly in mind to require further comment. They shortened the war, saved billions of dollars and millions of lives, and were one of the essential elements in victory.

One thing which does require comment, however, is this peculiar fact: Why has it been only in times of desperate emergency that the government has called upon the scientists of the country in any significant way to perform service, and why is it only at these times that the government has provided the funds necessary to implement any scientific programs of substantial character?

President Roosevelt had this question constructively in mind when he wrote in November 1944 to Dr. Vannevar Bush, Director of the Office of Scientific Research and Development, requesting recommendations for a program to aid research activities by public and private organizations, to continue the war of science against disease, and to discover and develop scientific talent in American youth, so that the continuing future of scientific research in this country may be assured on a level comparable to what has been done during the war. Dr. Bush had this in mind in his reply to the President when he said:

New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war, we can create a fuller and more fruitful employment, and a fuller and more fruitful life.

But let me approach this matter from another angle.

I fear that the American public generally has a false sense of security through a naive belief in the superiority of American science over that in other

countries. This belief undoubtedly comes about naturally from the fact that American industry has shown unparalleled initiative, drive, and skill in pouncing upon the practical applications which can be built upon scientific discoveries made any place in the world and turning out manufactured products of superior quality and in unequalled quantities. American advertising, however, is not accustomed to admit that such and such of its developments have sprung from a scientific discovery in Holland, or in Russia, or in Germany. The actual fact is that American science is strong and its scientists are able, but America has no monopoly, nor does it have even a majority position, in the record of scientific discovery.

Along this line I quote three paragraphs from the first issue of the new McGraw-Hill publication *Science Illustrated*.

But our wartime victories in applied science were based largely on basic European research. The fission of uranium was first developed in Germany. Bloodbanks originated in the Soviet Union. The discovery of penicillin earned Nobel prizes for three British subjects.

It is a matter of prime concern that our own basic research has lagged so far behind our industrial capacity to absorb technological developments. The extent to which our industrial machine has lived off foreign basic knowledge is shown by the distribution of Nobel prizes. [The article then goes on to show that only 18 out of the total of 131 Nobel prizes which have been awarded in physics, chemistry, medicine, and physiology, have gone to scientists of the U. S.]

This situation is likely to grow worse unless definite steps are taken soon. Available figures show that only one-seventh of the national research budget was going for basic research before the war. Now as a result of war-interrupted educations of thousands of youth, the nation faces a deficit of scientifically trained personnel.

Actually, until about the time of the first World War, the United States was distinctly a third- or fourth-rate nation so far as science, either in scholarship or in creative research, was concerned.

Since about 1920 the United States has advanced with great rapidity, and by the beginning of World War II it had achieved a position roughly abreast of the other more advanced nations. No informed scientist, however, can say that it has ever achieved a superior position.

In my judgment the rapid advance of creative science in America since about 1920 was principally due to two causes. One of these was the increased public awareness of the value and power of science, arising from the demonstrations of its effectiveness which were made during World War I. American chemical industry, for instance, practically dates from this period. More able young men were drawn into scientific careers, and there was greater public support of scientific research.

The other great influence, in my judgment, was the program of postdoctoral National Research fellowships, which were financed by the Rockefeller Foundation and administered by the National Research Council. The Rockefeller Foundation realized that the war had interrupted the education of scientists, and that there was a deficit to be made up. Furthermore, this Foundation has always been intensely interested in the advancement of medical knowledge and art, and it had the foresight to realize that the most fundamental advances in medicine in the long-term future were likely to be based upon new discoveries in physics, chemistry, and biology. As a result, a majority of the top scientists in America at the present time and a majority of those who took the leading roles in our recent scientific war effort were scientists who had been given this opportunity for special advanced experience in research by these National Research fellowships.

From these facts we can certainly learn a lesson for our guidance today!

Now let me lead up to the subject of national policy by still a third route, the

financial one. If the scientific experience in this war proved any one thing, it proved that the teamwork of groups of competent scientists, supported by adequate technical assistance and all the equipment which they needed, could accomplish more than even the scientists themselves had dared dream. But such research programs cost money.

Industry can and will carry part of the load. But its interests are largely limited to the business possibilities of practical applications. For this and several other convincing reasons, we must, as in the past, look principally to the educational institutions to produce new scientific knowledge.

But in the past fifteen years or so the income from endowment funds of these institutions has seriously shrunk, and future prospects for large gifts and the growth of a new generation of great philanthropists are not promising. I need not expand upon this sad story.

We seem, therefore, to be faced with a very definite dilemma. The value of a vigorous program in creative science is clear. National policy requires it in the public interest. The institutions where the work can best be carried on cannot from private sources finance the whole load. This is true in all scientific fields and, above all, in the new field of nuclear science and atomic energy. Apparently the only possible answer to this dilemma is an adequate program of federal support of fundamental research.

It is such a program that ex-President Hoover sought unsuccessfully to finance by private gifts through the National Academy of Sciences while he was Secretary of Commerce. It is the same program, financed with federal funds, which was advocated by President Roosevelt, and now by President Truman, and for which bills have been introduced by forward-looking members of the Congress. It is a plan which has been followed for some years with considerable success in

Great Britain. It is a plan which is being followed on an enormous scale in the Soviet Union, where, for example, there was a strongly supported institute of nuclear science long before our own federal government gave a thought to atomic energy.

The time seems ripe for favorable action on the two great scientific projects now under consideration by our Congress: the establishment of a National Science Foundation and the establishment of an Atomic Energy Commission, both provided with adequate funds for investment in the security and prosperity of the United States. Having in mind the factors which I have already outlined and knowing rather well the conditions essential to efficient and successful scientific research (which differ in some important respects from running a railroad, or a factory, or a governmental bureau), I urge that we lend our full support to the following program of national policy in science:

1. Pass legislation to establish the National Science Foundation and to establish the Atomic Energy Commission.

2. See to it that this legislation is wisely drafted, but do not let desire for perfection unduly delay its passage. Minor defects can be corrected later as experience accumulates.

3. To the greatest extent possible, free the legislation from specific controls or restrictions; define objectives rather than specify rules for achieving them.

4. Place the control of the program in the hands of men who are competent, fair minded, concerned with its various major aspects, and experienced in the ways of science; and trust such men as patriotic citizens to handle the program in the public interest.

This scientific program is a matter of general interest to every element of the public. There is no profession or class of citizen who will not benefit from it. There is nothing in it of a political character. Are we not therefore justified in expecting that forward-looking statesmanship will enact the legislation, that patriotic citizenship will administer it wisely, and that the oncoming generations of scientists will carry it forward with high success to the benefit of all?